CURRICULUM VITAE
Michael Maclean Wolf

Sandia National Labs
CSRI/155
P.O. Box 5800, MS 1320
Albuquerque, NM 87185-1320

mmwolf@sandia.gov
(505) 284-9963 (office)
(217) 390-3635 (home)
http://www.sandia.gov/~mmwolf/

Research Interests

- High-performance computing, scientific computing, combinatorial algorithms.

Education

- Ph.D., Computer Science, University of Illinois at Urbana-Champaign, 2009.
  Advisor: Professor Michael T. Heath.
- B.S., Computer Science and Biology, Harvey Mudd College, 1998.

Professional Experience

- **Postdoc** (2009-present), Scalable Algorithms Dept., Sandia National Laboratories, Albuquerque, NM, Staff Mentor: Karen Devine. Research into scalable multicore/manycore algorithms, performance of climate modeling software, sparse matrix partitioning and ordering.
- **Graduate Research Assistant** (2007-2009), University of Illinois at Urbana-Champaign Computer Science Department, under the direction of Michael T. Heath.
- **Graduate Professional Intern** (Summers 2007, 2008), Computer Science Research Institute, Sandia National Laboratories, Albuquerque, NM, Staff Mentor: Erik Boman. Researched and developed two-dimensional matrix partitioning algorithms for reducing communication volume in parallel sparse matrix-vector multiplication as part of CSCAPES, a DOE SciDAC Institute. Implemented select partitioning algorithms in Isorropia, a load-balancing package in Trilinos.
- **DOE CSGF Intern** (Summer 2006), Computer Science Research Institute, Sandia National Laboratories, Albuquerque, NM, Staff Mentor: Karen Devine. Researched agent-based disease propagation models to be used in inverse problem of disease characterization from patient data. Researched combinatorial optimization problem of reducing the number of operations in matrix-vector multiplication.
- **DOE CSGF Intern** (Summer 2004), NERSC Scientific Computing Group, Lawrence Berkeley National Laboratory, Berkeley, CA, Staff Mentor: Ali Pinar. Researched and improved performance of parallel matrix-vector multiplication with scalar addition algorithm. Researched computational biology problems of protein folding.
- **Software Developer** (1998-2003), Advanced Computations Department, Stanford Linear Accelerator Center, Stanford, CA, Supervisor: Kwok Ko. Developed parallel electromagnetic solvers and particle tracking software used in accelerator design as part of DOE SciDAC and Grand Challenge projects. Improved parallel performance of applications with better

partitioning and communication techniques. Managed software projects and mentored seven summer students. Involved in setting up Linux cluster.

- **Software Developer** (Summer/Winter Breaks 1996-1998), MPI Software Technology, Inc., Starkville, MS. Software engineer and author of documentation. Responsibilities included writing documentation explaining how to use MPI, developing MPI-2 technology, and providing consultation on commercial MPI implementations.
- **HMC Clinic Team Leader** (1997-1998), HMC Computer Science Clinic, Claremont, CA Optivus Technology, Inc. Project. Led a team of four students in designing and developing a software tool for allowing accurate, automatic, and rapid registration of radiographic images. Responsibilities included project design, interaction with Optivus liaison, and writing image registration software.
- **Intern** (Summer 1996), NSF Research Experience for Undergraduates, Engineering Research Center, Mississippi State University, MS, Mentor: Anthony Skjellum. Researched object-oriented programming techniques. Learned how to write parallel programs using the Message Passing Interface (MPI). Implemented parallel conjugate gradient algorithm using C++ and the MPI library. Researched three approaches to object-oriented MPI programming: MPI-2 C++ bindings, MPI++, and OOMPI.

Journal Articles

- E.G. Boman and M.M. Wolf, "A Nested Dissection Approach to Sparse Matrix Partitioning for Parallel Computations." (submitted paper.)
- M.M. Wolf and M.T. Heath, "Combinatorial Optimization of Matrix-Vector Multiplication in Finite Element Assembly," *SIAM Journal on Scientific Computing*, Volume 31, Issue 4, 2009, pp. 2960-2980.
- A. Skjellum, D. Wooley, Z. Lu, M. Wolf, P. Bangalore, A. Lumsdaine, J. Squyres, B. McCandless, "Object-Oriented Analysis and Design of the Message Passing Interface," *Concurrency and Computation: Practice and Experience*, Volume 13, Issue 4, 2001, pp. 245-292.

Conference Proceedings

- M.M. Wolf, E.G. Boman, and C. Chevalier, "Improved Parallel Data Partitioning by Nested Dissection with Applications to Information Retrieval." (Under revision.)
- E.G. Boman, U.V. Catalyurek, C. Chevalier, K.D. Devine, I. Safro, and M.M. Wolf. "Advances in Parallel Partitioning, Load Balancing, and Matrix Ordering," *J. of Physics: Conference Series*, vol. 180, 012008. (SciDAC09 Conference, San Diego, June 2009.)
- M.M. Wolf, E.G. Boman and B. Hendrickson, "Optimizing Parallel Sparse Matrix-Vector Multiplication by Corner Partitioning," PARA08, Trondheim, Norway, May 2008. (accepted paper.)
- M. Wolf, A. Guetz and C.-K. Ng, "Modeling Large Accelerator Structures with the Parallel Field Solver Tau3P," *18th Annual Review of Progress in Applied Computational Electromagnetics: ACES 2002*.
- V. Ivanov, C Adolphsen, N. Folwell, L. Ge, A. Guetz, Z. Li, C.-K. Ng, J.W. Wang, M. Wolf, K. Ko, G. Schussman, M. Weiner, "Simulating Accelerator Structure Operation at High Power," *Proceedings of the 2003 Particle Accelerator Conference*, 2003, pp. 2664-2666.

- N. Folwell, L. Ge, V. Ivanov, Z. Li, C.-K. Ng, G. Schussman, M. Weiner, M. Wolf, and K. Ko, "Numerical Studies of Field Gradients and Dark Currents in SLAC Structures," *Proceedings of the International Computational Accelerator Physics Conference*, 2002.
- L.-Q. Lee, L. Ge, M. Kowalski, Z. Li, C.-K. Ng, G. Schussman, M. Wolf, K. Ko, "Solving Large Sparse Linear Systems in End-to-end Accelerator Structure Simulations," *Proceedings of 18th International Parallel and Distributed Processing Symposium*, 2004.
- Z. Li, N. Folwell, L. Ge, A. Guetz, V. Ivanov, M. Kowalski, L. Lee, C. Ng, G. Schussman, R. Uplenchwar, M. Wolf, and K. Ko, "X-band Linear Collider R&D in Accelerating Structures through Advanced Computing," *Proceedings of 9th European Particle Accelerator Conference*, 2004.

Presentations

- "Improved Data Partitioning by Nested Dissection with Applications to Information Retrieval," SIAM Workshop on Combinatorial Scientific Computing (CSC09), Seaside, CA, October 29-31, 2009. (Refereed presentation).
- "Hypergraph-Based Combinatorial Optimization of Matrix-Vector Multiplication," 2008 SIAM Annual Meeting, San Diego, CA, July 7-11, 2008. (Minisymposium Talk.)
- "Optimizing Parallel Sparse Matrix-Vector Multiplication by Partitioning," 2008 CSCAPES Workshop, Santa Fe, NM, June 10-13, 2008. (Invited Talk.)
- "Nested Dissection Approach for Sparse Matrix Partitioning," SIAM Conference on Parallel Processing for Scientific Computing, Atlanta, GA, 2008. (Contributed Talk.)
- "Using Parallel Mesh Partitioning Strategies to Improve the Performance of Tau3P, an Electromagnetic Solver," SIAM Conference on Parallel Processing for Scientific Computing, San Francisco, CA, 2004. (Contributed Talk.)
- "Modeling Large Accelerator Structures with the Parallel Field Solver Tau3P," 18th Annual Review of Progress in Applied Computational Electromagnetics, Monterey, CA, 2002. (Contributed Talk.)
- "Combinatorial Optimization of Matrix-Vector Multiplication," SciDAC 2007 Conference, Boston, MA. (Poster Presentation.)
- "Tau3P: A Parallel Time-Domain Solver for the DOE Grand Challenge," International Computational Accelerator Physics Conference, Monterey, CA, 2002. (Poster Presentation with C. Ng.)

Technical Reports and Other Papers

- M. Wolf and E. Boman, "An Increasing Role for Combinatorial Methods in Large-Scale Parallel Simulations," *SIAM News*, Volume 41, Number 5, June 2008.
- M. Wolf and E. Boman, "Partitioning for Parallel Sparse Matrix-Vector Multiplication," SANDIA Technical Report SAND2007-7977, Sandia National Laboratories, 2007, pp. 75–86.
- J. Ray, B. M. Adams, K. D. Devine, Y. M. Marzouk, M. M. Wolf, and H. N. Najm, "Distributed Micro-Releases of Bioterror Pathogens: Threat Characterizations and Epidemiology from Uncertain Patient Observables," SANDIA Technical Report SAND2008-6044, Sandia National Laboratories, 2008.

Honors, Awards, and Travel Grants

- **Department of Energy Computational Science Graduate Fellowship (CSGF)**, 2003-2007.
- **University of Illinois Fellowship**, 2007-2008.
- SIAM Student Chapter Certificate of Recognition as UIUC Student Chapter President, 2008.
- SIAM Travel Award, Conference on Parallel Processing for Scientific Computing, 2008.
- Co-author of Best Poster, International Computational Accelerator Physics Conference, 1998.
- Dean's List, Harvey Mudd College, 1995-98 (all semesters).

Service

- **Organizer**, Gene Golub Symposium at UIUC, Urbana, Illinois, February 29 - March 1, 2008.
- **Co-organizer**, Combinatorial Scientific Computing Minisymposium, 2008 SIAM Annual Meeting, July 7-11, 2008.
- **SIAM UIUC Student Chapter President**, 2007-2009.
- SIAM UIUC Student Chapter Vice-President, 2006-2007.
- Reviewer for *Applied Mathematics and Computation*.
- Reviewer for *International Journal of High Performance Computing*.
- UIUC CS Fellowship, Assistantship, and Admissions Committee, 2008-present.
- UIUC Computer Science Undergraduate Studies Committee, 2006-2007.

Computer Skills

- Languages: C++, Fortran, C, Matlab, Perl, Python, Java, Lex, Yacc, et al.
- Systems: UNIX (MacOS X, Linux, Solaris, etc.), MS-Windows.
- Libraries: MPI, OpenMP, Zoltan, Trilinos, ParMETIS, PETSc, BLAS, SuperLU, et al.